REMARKS

The title has been amended to more accurately describe the claimed invention.

The paragraph at page 5, lines 3-13, of the specification has been amended to correct an inadvertent typographical error. Specifically, the word "density" was added at page 5, lines 7 to recite a "...surface area density of about 1.6 m^2/g." Even without the amendment, those of ordinary skill in the art would appreciate that what was described was a surface area *density* because that sentence recites "m^2/g" which are the units used to describe a surface area density. Applicant have simply added the word "density" to more definitely describe an embodiment of the invention.

Claim 1 has been amended to recite that the carbon-carbon composite foam has a structure of interconnecting pores that allow fluid to flow through the carbon-carbon composite foam. Support for this amendment can be found throughout the specification and originally filed claims, including at page 3, lines 19-28.

Claim 2 has been canceled.

Claim 3 has been amended to be dependent from Claim 1 and to correct an inadvertent typographical error. Specifically, the hyphen in "essentially-isotropic" has been removed.

Claim 4 has been amended to replace the phrase "consists essentially" with the phrase "comprises one" and to recite "crystalline carbon." Support for this amendment can be found throughout the specification, including at page 5, lines 21-27.

Claim 7 has been amended to recite that the claimed composite foam is a pyrolysis product of a thermoset polymer. Support for this amendment can be found throughout the specification, including at page 5, lines 8-10.

Claim 8 has been amended to recite the phrase "the pyrolytic carbon" and to replace the phrase "included between a reticulated foam skeleton and a by-product" with the phrase "deposited by the thermal decomposition." Support for this amendment can be found throughout the specification, including at page 6, line 23-26.

Claims 9 and 10 have been canceled.

Claim 11 has been amended to replace the phrase "wherein the product of a pyrolyzed liquid precursor is any" with the phrase "comprising a ceramic coating comprising at least" and

to delete the word "carbon." Support for this amendment can be found throughout the specification, including at page 7, lines 1-7.

Claim 12 has been amended to replace the phrase "a liquid precursor for forming the product" with the phrase "the pyrolytic carbon coating." Support for this amendment can be found throughout the specification, including at page 6, lines 27-29.

Claim 13 has been amended to depend from Claim 12, to include the phrase "pyrolytic carbon coating has a," and to remove the phrase "the liquid precursor." Support for this amendment can be found throughout the specification, including at page 6, lines 27-29.

Claim 14 has been amended to be dependent from Claim 11, to include the phrase "the ceramic coating is deposited by the thermal decomposition of," to remove the phrase "for forming the produce is," to replace the word "a" with "the," to add the word "essentially," and to remove cyclohexane, n hexane, and benzene from the group of liquid precursors. Support for this amendment can be found throughout the specification, including at page 6, line 23-26, and at page 7, lines 1-7.

Claim 15 has been amended to more definitely describe the claimed composite foam. Specifically, Claim 15 has been amended to recite the claimed composite further includes a chemical vapor deposition coating deposited on the pyrolytic carbon coating. Support for this amendment can be found throughout the specification, including at page 10, lines 22-27.

Claim 19 has been amended to correct an inadvertent typographical error. Specifically, the word "density" was added so that the claim recites a "...surface area density of about 1.6 m^2/g." Even without the amendment, those of ordinary skill in the art would appreciate that the claim was directed towards a surface area *density* because Claim 19 recited "m^2/g" which are the units used to describe a surface area density. Applicant have simply added the word "density" to more definitely describe the claimed invention.

Claims 20-22 are newly submitted and are directed towards composite foams having a solid density of at least about 67%, 76%, and 82%, respectively. Support for these new claims can be found throughout the original application, including at page 11, lines 8 and 9 of the specification.

Claims 23-43 are newly submitted and are directed towards composite foams having a solid density that is greater at the interior of the composite foam than at the periphery of the

composite foam. Support for these new claims be can found throughout the specification and originally filed claims, including at page 10, lines 23 and 24; page 11, lines 8 and 9; and originally filed Claims 1, 2, and 4-19.

Claim 44 is newly submitted and is directed towards composite foams having a solid density of greater than 30% and a pyrolytic coating comprising at least one of silicon carbide and silicon nitride. Support for this new claim can be found throughout the specification and originally filed claims, including at page 3, lines 3-6, and at page 6, lines 27 and 28.

No new matter has been added.

Telephonic Interview

Applicant would like to thank the Examiner for the telephonic interview conducted on June 2, 2004. While a consensus was not reached, the Examiner provided suggestions during the interview that were helpful in formulating this reply.

Rejection of Claim 1-19 Under 35 U.S.C. § 102(a) in View of Allied Signal, Inc.

Claims 1-19 were rejected under 35 U.S.C. § 102(a) as being anticipated by PCT Application WO 98/27023 by Allied Signal, Inc. The Examiner stated that Allied Signal discloses the claimed open lattice carbon structure coated with the claimed pyrolytic carbon coating.

Applicant respectfully disagrees. Allied Signal teaches a carbon-carbon composite material formed by densifying a preform. The preform is a reticulated structure that allows the diffusion of gases or infusion of liquids into the interior of the structure, thereby allowing for densification. Allied Signal does not teach or suggest a liquid densification process, but instead teaches densifying the preform using a chemical vapor deposition or pitch impregnation process. The resulting densified structure taught by Allied Signal has some interconnected voids, but the voids are on the scale of only a few hundred microns in diameter. (WO 98/27023, page 2, lines 25-29 and page 6, lines 2 and 3)

Allied Signal does not teach or suggest Applicant's claimed carbon-carbon composite foam that defines a structure of interconnecting pores that allow fluid to flow through the carbon-carbon composite foam. While the preforms taught by Allied Signal do have interconnected

voids, the final densified structure has interconnected spaces that are relatively small in comparison to the bulk foam structure. A fluid could not flow through the composite carbon-carbon foams taught by Allied Signal. Furthermore, Allied Signal teaches away from foams with such an open lattice by stating that it is advantageous to fill void spaces with a carbonaceous material. (WO 98/27023, page, lines 4-9)

With respect to the newly presented Claims 23-43, Allied Signal does not teach or suggest a composite foam having a solid density that is greater at the interior of the composite foam than at the periphery of the composite foam.

Applicant respectfully request the rejection be withdrawn.

Rejection of Claim 1-19 Under 35 U.S.C. § 102(b) in View of Tanzilli, et al.

Claims 1-19 were rejected under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent 5,540,996 issued to Tanzilli, et al. The Examiner stated that Tanzilli, et al. disclose the claimed open lattice carbon structure coated with the claimed pyrolytic carbon coating.

Applicant respectfully disagrees. Tanzilli, et al. teach a thermal insulating device for use as the exterior coating of a space vehicle which consists essentially of a rigid carbon-carbon foam having elastomeric foam bonded to the rear surface thereof and having a chemically vapor deposited coating applied to the front and side surfaces. The rigid carbon-carbon foam consists of a hydrocarbon resin, carbon fibers, and carbon microspheres and is formed by admixing the components and then heating to convert the binder and spheres to carbon. Following carbonization, a surface coating is applied to the front and side surfaces of the foam and the elastomeric foam pad is bonded to the rear surface.

Tanzilli, et al. do not teach or suggest Applicant's claimed carbon-carbon composite foam that defines a structure of interconnecting pores that allow fluid to flow through the carbon-carbon composite foam. With respect to the newly presented Claims 23-43, Tanzilli, et al. do not teach or suggest a composite foam having a solid density that is greater at the interior of the composite foam than at the periphery of the composite foam.

Applicant respectfully request the rejection be withdrawn.

Rejection of Claim 1-19 Under 35 U.S.C. § 102(a) in View of Brazel or Gebhardt, et al.

Claims 1-19 were rejected under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent 4,892,783, issued to Brazel, or U.S. Patent 4,442,165, issued to Gebhardt, et al. The Examiner stated that Brazel or Gebhardt, et al. disclose the claimed open lattice carbon structure coated with the claimed pyrolytic carbon coating.

Applicant respectfully disagrees. Gebhardt, et al. teach a low-density, thermally insulating composite which is ablation resistant. The composite is formed of a syntactic foam material which is covered and penetrated by carbon vapor in order to increase its strength and thermal insulating characteristics. The resulting carbon-carbon foam is impervious to liquids and gases.

While Gebhardt, et al. do teach that the carbon vapor can penetrate into the foam material, the porosity of the foam material may not even be sufficient to allow *vapor* to reach the interior of the foam, yet alone allow a *liquid* to flow completely through the carbon-carbon foam. (U.S. Patent 4,442,165, Col. 2, lines 41-51) Furthermore, Gebhardt, et al. teaches that the final carbon-carbon composite foam is impervious to liquids and vapors.

Brazel teaches a tri-element carbon based heat shield that has an outer layer including a carbon-carbon composite, a middle layer including pyrolytic graphite deposited onto an inner surface of the outer layer, and an inner layer including carbon felt or foam having low density and high mechanical compliance. The inner foam layer includes voids randomly disposed throughout the material constituting the foam. (U.S. Patent 4,892,783, col. 4, lines 26-27) Brazel teaches that one type of carbon foam suitable for use is the foam taught by Gebhardt, et al.

Neither Brazel nor Gebhardt, et al. teach or suggest Applicant's claimed carbon-carbon composite foam that defines a structure of interconnecting pores that allow fluid to flow through the carbon-carbon composite foam. With respect to the newly presented Claims 23-43, neither Brazel nor Gebhardt, et al. teach or suggest a composite foam having a solid density that is greater at the interior of the composite foam than at the periphery of the composite foam.

Applicant respectfully requests the rejection be withdrawn.

Rejection of Claim 1-19 Under 35 U.S.C. § 102(a) in View of Murdie, et al. or Klett, et al.

Claims 1-19 were rejected under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent 6,077,464, issued to Murdie, et al, or U.S. Patent 6,037,032, issued to Klett, et al. The Examiner stated that Murdie, et al, or Klett, et al. disclose the claimed open lattice carbon structure coated with the claimed pyrolytic carbon coating.

Applicant respectfully disagrees. U.S. Patent 6,077,464, issued to Murdie, et al., is the U.S. equivalent of Allied Signal, discussed above. For the same reasons previously stated for the rejection under the teachings of Allied Signal, Murdie, et al. does not teach or suggest applicant's claimed invention.

Klett, et al. teaches a process for producing a carbon foam heat sink. The heat sinks include a pitch-derived carbon foam that is encased in carbon facesheets and contain a material that undergoes a phase change at some point in the temperature range at which the heat sink is to operate. The pitch-derived carbon foam has an open porosity. In one embodiment, the pitch-derived carbon foam is densified with carbon using chemical vapor infiltration. (U.S. Patent 6,037,032, col. 9, lines 22-29)

While the pitch-derived foams taught by Klett, et al. do have an open porosity, Klett, et al. do not teach or suggest that the resulting carbon-carbon foam has an open porosity. As such, Klett, et al. do not teach or suggest Applicant's claimed carbon-carbon composite foam that defines a structure of interconnecting pores that allow fluid to flow through the carbon-carbon composite foam. With respect to the newly presented Claims 23-43, Klett, et al. does not teach or suggest a composite foam having a solid density that is greater at the interior of the composite foam than at the periphery of the composite foam.

Applicant respectfully requests the rejection be withdrawn.

CONCLUSION

The title of the application has been amended, as has the paragraph at page 5, lines 3-13. Claims 2, 9, and 10 have been canceled. Claims 1, 3, 4, 7, 8, 11-15, and 19 have been amended. Claims 20-44 are newly submitted. In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application

be passed to issue. If the Examiner believes that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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